

622. The tactile interface layer may be applied over a display, but may alternatively be applied on to a surface without a display. However, the tactile interface layer may be applied to any suitable surface of a device that may benefit from a tactile interface. The tactile interface layer 100 of this variation preferably includes a layer 110 that defines a surface 115, a substrate 120 that at least partially defines a fluid vessel 127 that includes a volume of fluid 112, and a displacement device 130 coupled to the fluid vessel 127 that manipulates the volume of fluid 112 to expand and/or contract at least a portion of the fluid vessel 127, thereby deforming a particular region 113 of the surface 115. The substrate 120 may also include a support region that substantially prevents inward deformation of the layer 110 (for example, inward deformation into the fluid vessel 127). The tactile interface layer 100 of this variation may also include a second layer 210 (as shown in FIGS. 10a and 10b) that allows for an additional degree of deformation of the surface 115. In this variation of the tactile interface layer 100, the step of manipulating the deformable region of the surface based on the command Step S130 preferably includes manipulating the fluid within the fluid vessel 127. In particular, the displacement device 130 is preferably actuated to manipulate the fluid within the fluid vessel 127 to deform a particular region 113 of the surface. The fluid vessel 127 preferably includes a cavity 125 and the displacement device 130 preferably influences the volume of fluid 112 within the cavity 125 to expand and retract the cavity 125. The fluid vessel 127 may alternatively be a channel 138 or a combination of a channel 138 and a cavity 125, as shown in FIG. 3b. The fluid vessel 127 may also include a second cavity 125b in addition to a first cavity 125a. When the second cavity 125b is expanded, a second particular region 113b on the surface 115 is preferably deformed. The displacement device 130 preferably influences the volume of fluid 112 within the second cavity 125b independently of the first cavity 125a. As shown in FIG. 5, the tactile interface layer of this variation may include a valve 139 that functions to direct fluid within the tactile interface layer 100. In this variation, the step of manipulating the fluid within the fluid vessel 127 may include actuating the valve 139 to direct fluid within the tactile interface layer 100. Alternatively, the user interface enhancement system 100 may include a second displacement device 130 that functions to influence the volume of fluid 112 within the second cavity 125b to expand and retract the second cavity 125b, thereby deforming a second particular region 113b of the surface. The second cavity 125b is preferably similar or identical to the cavity 125, but may alternatively be any other suitable kind of cavity. The following examples may be described as expanding a fluid vessel 127 that includes a cavity 125 and a channel 138, but the fluid vessel 127 may be any other suitable combination of combination of cavity 125 and/or channel 138. However, any other suitable type of tactile interface layer 100 may be used.

[0018] The tactile interface layer 100 preferably functions to provide tactile guidance to a user when using a device that the tactile interface layer 100 is applied to. As shown in FIG. 4, the surface 115 of the tactile interface layer 100 preferably remains flat until tactile guidance is to be provided to the user at the location of the particular region 113. In the variation of the tactile interface layer 100 as described above, the displacement device 130 then preferably expands the cavity 125 (or any other suitable portion of the fluid vessel 127) to expand the particular region 113 outward, forming a deformation that may be felt by a user (referenced throughout this

document as a “tactilely distinguishable formation”), and providing tactile guidance for the user. The expanded particular region 113 preferably also provides tactile feedback to the user when he or she applies force onto the particular region 113 to provide input. This tactile feedback may be the result of Newton’s third law, whenever a first body (the user’s finger) exerts a force on a second body (the surface 115), the second body exerts an equal and opposite force on the first body, or, in other words, a passive tactile response. Alternatively, the displacement device 130 may retract the cavity 125 to deform the particular region 113 inward. However, any other suitable method of deforming a particular region 113 of the tactile interface layer 100 may be used.

[0019] The tactile interface layer 100 preferably includes a sensor that functions to detect the gesture of the user, for example, a capacitive sensor that functions to detect the motion of a finger of the user from the first location to the second location. Alternatively, in the variation of the tactile interface layer 100 as described above, a pressure sensor located within the fluid vessel 127 may be used to detect changes in pressure within the fluid vessel 127 to detect the motion of a finger of the user from the first location to the second location. Alternatively, the sensor may be a sensor included in the device to which the tactile interface layer 100 is applied to, for example, the device may include a touch sensitive display onto which the tactile interface layer 100 is overlaid. The gesture of the user may be detected using the sensing capabilities of the touch sensitive display. However, any other suitable gesture detection may be used.

[0020] Similarly, the tactile interface layer 100 preferably includes a processor that functions to interpret the detected gesture as a command. The processor preferably functions to discern between a gesture that is provided by the user to be a command a gesture that may be provided by the user but not meant to be a command, for example, an accidental brush of the finger along the surface of the tactile interface layer 100. The processor may include a storage device that functions to store a plurality of gesture and command associations and/or user preferences for interpretations of gestures as commands. The processor may be any suitable type of processor and the storage device may be any suitable type of storage device, for example, a flash memory device, a hard-drive, or any other suitable type. The processor and/or storage device may alternatively be a processor and/or storage device included into the device that the tactile interface layer 100 is applied to. However, any other suitable arrangement of the processor and/or storage device may be used.

[0021] As shown in FIG. 6, a gesture may be one of a variety of movements of one or more fingers of the user across the surface 115 of the tactile interface layer 100. The gesture may be detected as a swipe from a first location to a second location arranged in any suitable location along the surface 115 of the tactile interface layer 100. Alternatively, this first variation of gesture may be detected as a swipe from a first location relative to a deformed particular region 113 to a second location relative to the deformed particular region 113. Detection of a gesture relative to a deformed particular region 113 may be particularly useful in the variation of the tactile interface layer 100 that includes a plurality of deformable regions and may function to allow the interpretation of the gesture as a command for a particular deformable region that is substantially proximal to the detected gesture. However, the gesture may be detected relative to any other suitable portion of the tactile interface layer.